REPORT DOCUMENTATION PAGE

AFRL-SR-BL-TR-98-0526

pproved 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour gathering and maintaining the data needed, and completing and reviewing the collection collection of information, including suggestions for reducing this burden, to Washington Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project, ...

rching existing data sources, e or any other aspect of this and Reports, 1215 Jefferson n, DC 20503.

1. AGENCY USE ONLY *(Leave Blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	8 June 98	**Final** 1 Jul 97 – 31 Dec 97

4. TITLE AND SUBTITLE
Neural Networks for Signal Processing VII
Proceeding of the 1997 IEEE Workshop

5. FUNDING NUMBERS
G
2313-BS

6. AUTHORS
see Authors Indes

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Institute of Electrical and Electronics Engineers, Inc.
445 Hoes Lane, P.O. Box 1331
Piscataway, NJ 08855-1331

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Air Force Office of Scientific Research
110 Duncan Ave, Room B116
Bolling AFB, DC 20332-8080

NL

10. SPONSORING / MONITORING AGENCY REPORT NUMBER
F49620-97-1-0311

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Unlimited

19980710 034

13. ABSTRACT *(Maximum 200 words)*

NNSP'97 was held in Amelia Island Plantation, Amelia Island, Florida, September 24-26. 1997. NNSP'97 was sponsored by the Neural Networks Technical Committee of the IEEE Signal Processing Society, in cooperation with the IEEE Neural Networks Council and with co-sponsorship from the AFOSR.

This year two topics were announced in the call for papers. The goal was to create a critical mass of submissions and dedicate a full session to discuss a topic of current interest. This year topics were blind signal processing and pattern recognition applications. we had an exciting technical program with first rate papers and speakers.

We invited as plenary speakers Drs. Simon Haykin, from McMaster University, David Brown from F.D.A., S.Y. Kung, from Princeton, J.F. Cardoso, from Paris V, and Yann LeCun from ATT/BellLabs. Eighty high quality papers were presented with contributions from 16 countries. The proceedings were distributed at the conference, and were published by the IEEE Press. The organization sponsored ten students to present their work.

The highlights of the conference were the following: the advances made on blind source separation, both at the theoretical level and in practical applications; the advances in the implementation of the support vector machines; the interest in recurrent neural networks; the exciting new applications of neural networks to multimedia, and the continuing interest in biomedical applications. All the sessions were very lively, in particular the excellent poster sessions where lenghtie discussions among researchers were conducted.

Overall this was high quality conference, which everybody enjoyed greatly.

14. SUBJECT TERMS	15. NUMBER OF PAGES
Neural Networks Pattern Recognition Blind Source Separation	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	**Unclassified**	**Unclassified**	**UL**

NSN 7540-01-280-5500

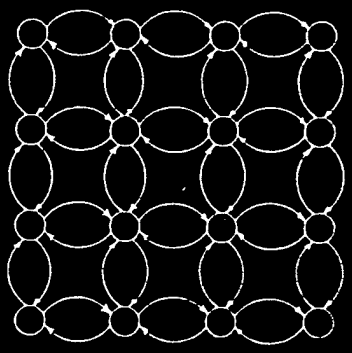
Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. Z39-1

DTIC QUALITY INSPECTED 1

JUN 17 1998

Neural Networks for Signal Processing VII

PROCEEDINGS OF THE 1997 IEEE WORKSHOP



Edited by
Jose Principe
Lee Gile
Nelson Morgan
Elizabeth Wilson

NEURAL NETWORKS FOR SIGNAL PROCESSING VII

PROCEEDINGS
OF THE 1997 IEEE
SIGNAL PROCESSING
SOCIETY WORKSHOP

Seventh in a Series of Workshops
Organized by the IEEE Signal Processing Society
Neural Networks Technical Committee

Edited by

Jose Principe
Lee Gile
Nelson Morgan
Elizabeth Wilson

Published under the sponsorship of the IEEE Signal Processing Society
in cooporation with the IEEE Neural Networks Council
and co-sponsored by the Air Force Office of Scientific Research (AFOSR)

The Institute of Electrical and Electronic Engineers, Inc.
New York, New York

1997 IEEE Workshop on Neural Networks for Signal Processing Proceedings

Copyright and Reprint Permission

IEEE Catalog Number	97TH8330
ISBN	0-7803-4256-9 (softbound) 0-7803-4257-7 (microfiche)
ISSN	1089-3555

Additional copies of this publication are available from

IEEE Operations Center
P.O. Box 1331
445 Hoes Lane
Piscataway, NJ 08855-1331 USA

1-800-678-IEEE
1-908-981-1393
1-908-981-9667 (FAX)
833-233 (Telex)
email: customer.services@ieee.org

The chapters in this book are based on presentations given at the IEEE Signal Processing Society Workshop on Neural Networks for Signal Processing.

Preface

This book contains referred papers presented at the Seventh IEEE Workshop on Neural Networks for Signal Processing (NNSP '97) held at the Amelia Island Plantation, Amelia Island, Florida on September 24–26, 1997.

The Neural Networks Technical Committee of the IEEE Signal Processing Society sponsored NNSP '97, in cooperation with the IEEE Neural Network Council and with co-sponsorship from the Air Force Office of Scientific Research (AFOSR). We designed the workshop to serve as a regular forum for researchers in academia and industry who are interested in the exciting field of neural networks for signal processing. Neural networks offer a fresh view for the important problems faced in signal processing because they extend linear models and go beyond the assumptions of stationarity and Gaussianity traditionally imposed in signal processing.

This year we announced two topics in the call for papers. The goal was to create a critical mass of submissions and dedicate a full session to discuss a topic of current interest. This year's topics are blind signal processing and biomedical applications. Each is important in its own right. Blind signal processing is a difficult but exciting area of signal processing with many practical applications for which the use of nonlinearity is key for acceptable solutions. The biomedical area has long been a challenging area due to the imprecise nature of human reasoning and the need for more sophisticated quantitative tools. Neural networks and other approximate reasoning methods are key players in this effort. We hope that this approach of electing topics will be successful and will make these proceedings a necessary reference for the advances reported in each field.

Our deep appreciation is extended to Drs. Simon Haykin, S.Y. Kung, J.F. Cardoso, Yann LeCun and David Brown for their insightful plenary talks. Our sincere thanks go to all members of the Technical Committee for the excellent and timely reviews, and above all to the authors whose contributions made this workshop possible.

Continuing with the tradition of paperless communication, this year's reviews and announcements were all electronic. Thanks to Dong-Wei Chen and Craig Fancourt for keeping the NNSP '97 Web page (http://www.cnel.ufl.edu/nnsp97/) current and effective. Special thanks go to Ms. Sharon Bosarge for her dedication and hard work to coordinate the many details necessary to put together the program and the local arrangements.

Jose C. Principe
Lee C. Giles
Bert DeVries
Nelson H. Morgan

NNSP '97 Technical Committee

Tulay Adali	University of Maryland Baltimore County
Charles M. Bachmann	Naval Research Laboratory
Andrew Back	RIKEN Laboratory
Sergio Carrato	University of Trieste
A. G. Constantinides	Imperial College
Federico Girosi	Massachusetts Institute of Technology
Allen L. Gorin	AT&T Laboratories
Lars Kai Hansen	Technical University of Denmark
John G. Harris	University of Florida
Yu-Hen Hu	University of Wisconsin - Madison
Jenq-Neng Hwang	University of Washington
Marc M. Van Hulle	University of Leuven
B. H. Juang	Lucent Technologies
Shigeru Katagiri	ATR Laboratories
Gary Kuhn	Siemens Corporate Research
S.Y. Kung	Princeton University
Jan Larsen	Technical University of Denmark
Richard Lippmann	MIT Lincoln Laboratory
Elias Manolakos	Northeastern University
John A. Sorensen	Technical University of Denmark
Volker Tresp	Siemens
Raymond Watrous	Siemens Corporate Research
Christian J. Wellekens	EURECOM

Table of Contents

THEORY

Invited Lecture:
Chaos, Radar Clutter, and Neural Networks
Dr. Simon Haykin 3

Nonparametric Regression Modeling with Topographic Maps as a Basis for Lossy Image Compression
Van Hulle, Marc M. 4

Entropy Manipulation of Arbitrary Nonlinear Mappings
Fisher, John W., III, and Principe, José C. 14

Adaptive Regularization of Neural Classifiers
Andersen, L. Nonboe, Larsen, J., Hansen, L. K., and Hintz-Madsen, M. 24

Remembering the Past; The Role of Embedded Memory in Recurrent Neural Network Architectures
Giles, C. Lee, Lin, Tsungnan, and Horne, Bill G. 34

Low Sensitivity Time Delay Neural Networks with Cascade Form Structure
Back, Andrew D., Horne, Bill G., Tsoi, Ah Chung, and Giles, C. Lee 44

Novel Projection Pursuit Indices for Feature Extraction and Classification: An Intercomparison in a Remote Sensing Application
Bachmann, Charles M. 54

Optimal Feature Extraction Techniques to Improve Classification Performance, With Application to Sonar Signals
Larkin, Michael J. 64

On Estimation of Nonlinear Black-Box Models: How to Obtain a Good Initialization
Sjoberg, Jonas 72

Interpretation of Recurrent Neural Networks
Pedersen, Morten With and Larsen, Jan 82

Extracting the Relevant Delays in Time Series Modelling
Goutte, Cyril 92

Combined Learning and Use for Classification and Regression Models
Miller, David J., Uyar, Hasan S., and Yan, Lian 102

Reducing False Alarm Risk in Transient Signal Classification
de Lassus, H., Lecacheux, A., Daigremont, P., Badran, F., and Thiria, S. 112

Multiple and Time-Varying Dynamic Modelling Capabilities of Recurrent Neural Networks
Back, Andrew D. 121

Induced Specialization of Context Units for Temporal Pattern Recognition and Reproduction
Kothari, Ravi and Agyepong, Kwabena 131

Uniform Approximation and the Complexity of Neural Networks
Ferreira, Paulo J.S.G. and Cao, Si-Qi 141

BIOMEDICAL

Invited Lecture:
Neural Networks for Medical Image Processing
David Brown 151

Mixture of Discriminative Learning Experts of Constant Sensitivity for Automated Cytology Screening
Hwang, Jenq-Neng and Lin, Eugene 152

Dynamics Modelling in Brain Circulation
Silipo, R., Schittenkopf, C., Deco, G., and Brawanski, A. 162

A Multiple-Classifier Architecture for ECG Beat Classification
Palreddy, Surekha, Hu, Yu Hen, Mani, Vijay, and Tompkins, Willis, J. 172

Applying Neural Networks to Adjust Insulin-Pump Doses
Andrianasy, Fidimahery and Milgram, Maurice 182

Medical Image Analysis by Probabilistic Modular Neural Networks
Wang, Yue, Adah, Tulay, and Kung, Sun-Yuan 654

MR Brain Image Classification by Multimodal Perceptron Tree Neural Network
Valova, Iren and Kosugi, Yukio 189

Texture Analysis and Artificial Neural Network for Detection of Clustered Microcalcifications on Mammograms
Kim, Jong Kook, Park, Jeong Mi, Song, Koun Sik, and Park, Hyun Wook 199

Neural Nets in Boundary Tracing Tasks
Crawford-Hines, Stewart and Anderson, Charles W. 207

Neurocomputing Applications in Post-Operative Liver Transplant Monitoring
Melvin, D. G., Niranjan, M., Prager, R. W., Trull, A. K., and Hughes, V. F. 216

Classification and Compression of ICEGs Using Gaussian Mixture Models
Coggins, Richard and Jabri, Marwan 226

Adaptive Control in Anaesthesia
Asteroth, Alexander, Moller, Knut, and Schwilden, Helmut 236

Wavelet Characteristics of Early Vision
Brooks, Geoffrey 244

ALGORITHMS

Invited Lecture:
Neural Networks and Gradient-Based Learning in OCR
Dr. Yann LeCun 255

The Gamma MLP-Using Multiple Temporal Resolutions for Improve Classification
Lawrence, Steve, Back, Andrew D., Tsoi, Ah Chung, and Giles, C. Lee 256

A Deterministic Annealing Approach to Discriminative Hidden Markov Model Design
Rao, Ajit, Rose, Kenneth, and Gersho, Allen 266

An Improved Training Algorithm For Support Vector Machines
Osuna, Edgar, Freund, Robert, and Girosi, Federico 276

Classification with Linear Networks Using a Constrained LDA Learning Algorithm
Principe, Jose C. and Xu, Dongxin 286

Combination of Adaptive Signal Processing and Neural Classification Using an Extended Backpropagation Algorithm
Doering, A. and Witte, H. 296

Wave Propagation as a Neural Coupling Mechanism: Hardware for Self-Organizing Feature Maps and the Representation of Temporal Sequences
Ruwisch, D., Dobrzewski, B., and Bode, M. 306

On-Line Adaptive Algorithms in Non-Stationary Environments Using a Modified Conjugate Gradient Approach
Chichocki, Andrzej, Orsier, Bruno, Back, Andrew, and Arnari, Shun-ichi 316

Segmentation and Identification of Drifting Dynamical Systems
Kohlmorgen, J., Muller, K.-R., and Pawelzik, K. 326

An Improved Scheme for the Fuzzifier in Fuzzy Clustering
Romdhane, L. Ben, Ayeb, B., and Wang, S. 336

Separable Non-Linear Least-Squares Minimization—Possible Improvements for Neural Net Fitting
Sjoberg, Jonas and Viberg, Mats 345

Training Recurrent Networks
Pedersen, Morten With 355

Combining Discriminant-Based Classifiers using the Minimum Classification Error Discriminant
Ueda, Naonori and Nakano, Ryohei 365

Cross-Entropy Based Pruning of the Hierarchical Mixtures of Experts
Whitworth, C. C. and Kadirkamanathan, V. 375

BLIND SIGNAL SEPARATION

Invited Lecture:
Blind Separation of Noisy Mixtures
Dr. Jean-Francois Cardoso 387

One-Unit Contrast Functions for Independent Component Analysis: A Statistical Analysis
Hyvarinen, Aapo 388

Feature Extraction Approach to Blind Source Separation
Lin, Juan K., Grier, David G., and Cowan, Jack D. 398

Blind Source Separation of Nonlinear Mixing Models
Lee, Te-Won and Koehler, Bert-Uwe 406

Blind Source Separation: Are Information Maximization and Redundancy Minimization Different?
Obradovic, D. and Deco, G. 416

Blind Signal Separation by Spatio-Temporal Decorrelation and Demixing
Choi, Seungjin and Cichocki, Andrzej 426

Multichannel Blind Separation and Deconvolution of Sources with Arbitrary Distributions
Douglas, Scott C., Cichocki, Andrzej, and Amari, Shun-ichi 436

Recurrent Canonical Piecewise Linear Network: Theory and Application
Liu, Xiao and Adali, Tulay 446

Blind Source Separation and Deconvolution by Dynamic Component Analysis
Attias, H. and Schreiner, C. E. 456

Neural Dual Extended Kalman Filtering: Applications in Speech Enhancement and Monaural Blind Signal Separation
Wan, Eric A. and Nelson, Alex T. 466

Bayesian Ying-Yang Learning Based ICA Model
Xu, Lei 476

A Neural Network Approach to Blind Source Separation
Mejuto, Cristina and Castedo, Luis 486

A Unifying Criterion for Blind Source Separation and Decorrelation: Simultaneous Diagonalization of Correlation Matrices
Wu, Hsiao-Chun and Principe, Jose C. 496

APPLICATIONS

Invited Lecture:
Neural Networks for Intelligent Multimedia Processing
Dr. S. Y. Kung 509

Nonlinear Prediction of Chaotic Time Series Using Support Vector Machines
Mukherjee, Sayan, Osuna, Edgar, and Girosi, Frederico 511

A DCT-Based Adaptive Metric Learning Model Using Asymptotic Local Information Measure
Satonaka, Takami, Baba, Takaaki, Chikamura, Takayuki, Otsuki, Tatsuo, and Meng, Teresa H. 521

Sub-Word Speaker Verification Using Data Fusion Methods
Farrell, Kevin R., Ramachandran, Ravi P., Sharma, Manish, and Mammone, Richard J. 531

A Chaotic Annealing Neural Network and Its Application to Direction Estimation of Spatial Signal Sources
Tan, Ying , Deng, Chao, and He, Zhenya 541

A Neural Network Equalizer With the Fuzzy Decision Learning Rule
Lee, Ki Yong, Lee, Sang-Yean, and McLaughlin, Stephen 551

Application of the Block Recursive Least Squares Algorithm to Adaptive Neural Beamforming
Di Claudio, E.D., Parisi, R., and Orlandi, G. 560

Nonlinear Committee Pattern Classification
Hu, Yu Hen, Knoblock, Thomas, and Park, Jong-Ming 568

Unsupervised Speaker Classification Using Self-Organizing Maps (SOM)
Voitovetsky, Itshak , Guterman, Hugo, and Cohen, Arnon 578

A Self-Scaling Neural Hardware Structure That Reduces the Effect of some Implementation Errors
Djahanshahi, H., Ahmadi, M., Jullien, G. A., and Miller, W. C. 588

Application of Neural Networks to the Problem of Forecasting the Flow of the River Nile
Atiya, Amir, El-Shoura, Suzan, Shaheen, Samir, and El-Sherif, Mohamed 598

Robustness of a Chaotic Modal Neural Network-Applied to Audio-Visual Speech Recognition
Kabre, Harouna 607

Applying Neural Networks and Other AI Techniques to Fault Detection in Satellite Communication Systems
Elerin, Liese, Learoyd, Charles, and Wilson, Beth 617

Multi-Linguistic Handwritten Character Recognition by Bayesian Decision-Based Neural Networks
Fu, Hsin-Chia and Xu, Y. Y. 626

Neural Networks for Engine Fault Diagnostics
Dong, Dawei W., Hopfield, John J., and Unnikrishnan, K. P. 636

Locally Recurrent Networks with Multiple Time-Scales
Juan, Jui-Kuo, Harris, John G., and Principe, Jose C. 645

Author Index 665